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(21) 出願番号	特願平1-213448	(71) 出願人	999999999 富士通株式会社 神奈川県川崎市中原区上小田中1015番地
(22) 出願日	平成1年(1989)8月19日	(72) 発明者	十合 博之 神奈川県川崎市中原区上小田中1015番地 富士通株式会社内
(65) 公開番号	特開平3-77402	(72) 発明者	岩附 元 神奈川県川崎市中原区上小田中1015番地 富士通株式会社内
(43) 公開日	平成3年(1991)4月3日	(72) 発明者	大宮 健司 神奈川県川崎市中原区上小田中1015番地 富士通株式会社内
		(74) 代理人	弁理士 井桁 貞一
		審査官	岸田 伸太郎

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(54) 【発明の名称】 誘電体フィルタ

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【特許請求の範囲】

【請求項 1】 誘電体板 (10) の上下面を金属で覆ってアース面 (21, 22) としたプリント板 (20) の長手方向に矩形導波管のTE₁₀₁モードでマイクロ波を伝送する誘電体フィルタであって、該プリント板の長手方向と横方向に該誘電体板の上下面のアース面 (21, 22) を接続する表面が導体の一組づつ対向する 2 組の溝 (31, 32; 41, 42) と、該 2 組の溝で囲まれた部分に該誘電体板を貫通して上下のアース面 (21, 22) を連結する相互の列の間隔が一定 (略々 1/2) で各列の孔の径が任意のスルーホール列 (5i, 6i) と、該スルーホール列 (5i, 6i) の前部と後部に該プリント板の表面の伝送線路 (71, 72) と接続される入出力結合部 (81, 82) を備えるようにした事を特徴とする誘電体フィルタ。

【請求項 2】 前記の 2 組の溝 (31, 32; 41, 42) を、前記

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スルーホール列 (5i, 6i) の各列の孔の径より小さい径の 2 組のスルーホール列 (31i, 32i, 41i, 42i) に代替したことを特徴とする第 1 項記載の誘電体フィルタ。

【発明の詳細な説明】

【概要】

誘電体板の上下面を金属で覆ってアース面としたプリント板の長手方向に矩形導波管のTE₁₀₁モードでマイクロ波を伝送する帯域通過の誘電体フィルタに関し、他の回路部品も実装される誘電体基板の平面プリント板に実装された場合に、全体の平面性を損なわない小形な誘電体フィルタを目的とし、プリント板の長手方向と横方向に該誘電体板の上下面のアース面を接続する表面が導体の一組づつ対向する 2 組の溝と、該 2 組の溝で囲まれた部分に該誘電体板を貫通して上下のアース面を連結する相互の列の間隔が一定

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(略λ/2)で各列の孔の径が任意のスルーホール列と、該スルーホール列の前部と後部に該プリント板の表面の入力と出力の伝送線路と接続される入出力結合部を備えるように構成する。又実施態様として前記の2組の溝を、前記スルーホール列の各列の孔の径より小さい径の2組のスルーホール列に代替する。

〔産業上の利用分野〕

本発明はマイクロ波無線装置に使用されるマイクロ波の帯域通過フィルタに係り、特に誘電体板の上下面を金属で覆ってアース面としたプリント板の長手方向にマイクロ波を矩形導波管のTE₁₀₁モードで伝送する誘電体フィルタに関する。

近年、無線装置の小形化の要求に伴い、各部品のチップ化、小形化が要求されている。その為、マイクロ波の帯域通過フィルタも、半同軸型の小形な誘導体フィルタが提供されているが、半同軸型フィルタは、通信周波数の高周波化に伴い挿入損失が大きくなり実用に耐えないので、高周波で使用に耐える新しいフィルタが望まれている。そのため、上記の誘導体板の上下面を金属で覆ってアース面としたプリント板を、長手方向に矩形導波管のTE₁₀₁モードで伝送する誘導体フィルタが考案されている。

〔従来技術〕

矩形導波管のTE₁₀₁モードで伝送する誘電体フィルタは従来、第5図の如く、板状の誘電体10Aの全面をメタライズした中身が誘電体で表面が導体のブロック19Aの、長手方向に、間隔がフィルタの中心周波数の凡そλ/2のポストのスルーホール(中)20Aとスルーホール(大)21Aを所要段数だけ設け、其の両端付近に入力ピン18Aと出力ピン17Aを設けて、外部のプリント板22Aの表面の、例えばスリッパラインの伝送線路に半田付けされ、該伝送線路からのマイクロ波を矩形導波管のTE₁₀₁モードと同じモードで伝送する構造となっていた。そしてスルーホール(中)20Aの径とスルーホール(大)21Aの径は、夫々フィルタの通過帯域幅と関係し、太くすると帯域幅は狭くなり、細くすると広がる特性を有し、板状の誘電体10Aの厚み24Aはフィルタの挿入損失に効き、薄くすると挿入損失は増加し、適度に厚くすると挿入損失は減少する。したがって第5図の従来の誘電体フィルタは、長さ方向は小形になるが挿入損失を減少させようとすると、誘電体10Aの厚み24Aが厚くなって、プリント板22Aの表面に第5図の(b)の如く実装すると、プリント板22Aの実装状態の厚さが厚くなって、他の部品小形化される中でこのフィルタがプリント板22Aの形状、大きさ等を支配し、装置全体の小形化には不利であるという問題があった。

〔本発明が解決しようとする課題〕

本発明は、他の回路部品も実装される誘電体基板の平面プリント板に実装される場合に、全体の平面性を損なわない小形な誘電体フィルタの提供を課題とする。

〔課題を解決するための手段〕

この課題は、矩形導波管のTE₁₀₁モードの誘電フィルタを考えた時、誘電体板の厚みは先に述べたように挿入損失には効いてくるが、通過帯域幅を決めるポストの形

(第3図ではスルーホール20A, 21Aの径)には直接には関係しない。即ち、厚さを薄くしてプリント板自身の誘電体の厚さとしてもよい事、及び誘電体板の全面を導体で覆えば無負荷のQ値を、半同軸共振モードに比べた十分高く取れる事を利用し、第1図の如く、誘電体板10の上下両面を金属で覆ってアース面21, 22としたプリント板20の長手方向と横方向に該誘電体板の上下両面のアース面(21, 22)を接続する表面が導体の一組づつ対向する2組の溝31, 32; 41, 42と、該2組の溝で囲まれた部分に誘電体板10を貫通して上下両面のアース面21, 22を繋げる相互の列間隔が一定(略λ/2)で各列の孔の径が任意のスルーホール列5i, 6iと、該スルーホール列5i, 6i前部と後部に該プリント板20の表面の伝送線路71, 72と接続される入出力結合部81, 82を有するように構成した本発明、又、其の実施態様として、第2図の如く、第1図の2組の溝31, 32; 41, 42の代りに、スルーホール列5i, 6iの各列に孔の径より小さい径の2組のスルーホール列31i, 32i; 41i, 42iを備えるようにした本発明によって解決される。

本発明の誘電体フィルタの基本構成を示す第1図の原理図において、

10は、板状の誘電体の誘電体板である。

20は、誘電体板10を基板として他の回路部品を設けたプリント板である。

21, 22は、誘電体板10の上面と下面を金属で覆ってアース面である。

31, 32; 41, 42は、プリント板20の長手方向と横方向に誘電体板10の上下面のアース面21, 22を接続する表面が導体の一組づつ対向する2組の溝である。

5i, 6iは、2組の溝31, 32; 41, 42で囲まれた部分に誘電体板10は貫通して上下両面のアース面21, 22を繋げる相互の列間隔が一定(フィルタの中心周波数の略λ/2)で各列の孔が任意の径のスルーホール列である。

71, 72は、スルーホール列5i, 6iの前部の後部の入出力結合部81, 82で結合されるプリント板20の表面の入力と出力の伝送線路である。

81, 82は、伝送線路71, 72と結合するスルーホール列5i, 6iの前部と後部の入出力結合部である。

そして第2図の31i, 32i; 41i, 42iは、第1図の2組の溝31, 32; 41, 42の代りに、スルーホール列5i, 6iの各列の孔の径より小さい径で、誘電体板10を貫通し上下面のアース面21, 22を接続する、一組づつ対向の2組のスルーホール列である。

〔作用〕

本発明の誘電体フィルタは、そのプリント板20の長手方向と横方向に、誘電体板10の上下面のアース面21, 22に

一組づつ対向して設けられた其の表面が導体の 2 組の溝 31, 32; 41, 42 が、誘電体板 10 の上下面のアース面 21, 22 を誘電体板 10 を貫通して導体接続し、長さ寸法が一定で、中身がプリント板 20 の誘電体であり、厚みがプリント板 20 の厚さの矩形導波管を形成し、入力伝送線路 71 から出力伝送線路 72 へ入出力結合部 81, 82 で結合され、 TE_{101} モードでマイクロ波を通過伝送する誘電体フィルタの母体となる。そしてこの 2 組の溝 31, 32; 41, 42 で囲まれた中身が誘電体の矩形導波管の内部に設けられたスルーホール列 5i, 6i は、フィルタの段数を決めるポストの作用をし、列の相互の間隔はフィルタの中心周波数の略 $\lambda/2$ に選ばれ、各列の孔の径は通過帯域幅を考慮して任意に選ばれる。そして其の厚さはプリント板自身の誘電体の厚さとしているので薄い。

然しながら、 TE_{101} モードを用いているため、その無負荷の Q 値を、半同軸共振モードに比べて十分高く取れるので問題は解決される。

【実施例】

第 1 図の原理図はそのまま、本発明の実施例の誘電体フィルタの構成を示し、既に詳述した。

第 2 図は本発明の別の実施例の誘導体フィルタであって、第 1 図の 2 組の溝 31, 32; 42, 42 の代りに、2 組のスルーホール（小）列 31i, 32i; 41i, 42i を用いて、上下のアース面 21, 22 の長さ寸法を区切り接続した例である。2 組のスルーホール（小）列 31i, 32i; 41i, 42i の各ホールの径は、該列に囲まれた内部のスルーホール列 5i, 6i の各列の孔に径より小さい径であり、誘電体 10 の上下のアース面 21, 22 の長さ寸法を区切って接続し、矩形導波管の管壁としている。

2 組のスルーホール（小）列 31i, 32i; 41i, 42i で誘電体板 10 の上下のアース面 21, 22 の長さ寸法を区切って接続したものが、矩形導波管の管壁として動作する事は、矩形導波管の TE_{101} モードの磁界及び電流の流れは、第 5 図の磁界及び電流の分布図の如く、点線矢印の電流の向

きから判るように、管の上から下へ、或いは下から上へ流れる電流は有るが、横方向に流れる電流は無い事から理解される。

第 3 図は本発明の更に別の実施例の誘電体フィルタであって、多層のプリント板の一部（点線で囲った第 2 層と第 3 層の部分）にフィルタを構成した例であって、マイクロ波のセラミック複合モジュールの一部に、本発明の誘電体フィルタを埋め込んだ例である。

第 1 図～第 3 図の何れの実施例は誘電体フィルタでも、誘電体板の厚さはプリント板自身の誘電体の厚さとしていっているので薄く、然しながら、マイクロ波信号の伝送は TE_{101} モードを用いているため、その無負荷の Q 値を、半同軸共振モードに比べて十分高く取れるので、問題は無い。

【発明の効果】

以上説明した如く、本発明によれば、プリント板の内部にフィルタを形成できるので、高密度の実装となり、マイクロ波無線装置の小形化に大きく寄与する効果が得られる。

20 【図面の簡単な説明】

第 1 図は本発明の誘電体フィルタの基本構成を示す原理図、

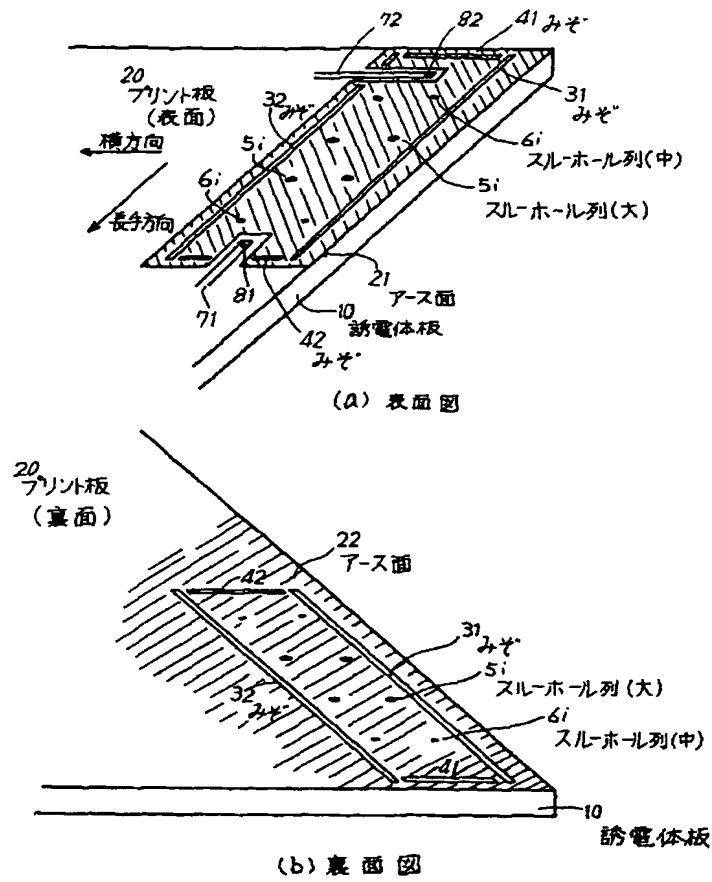
第 2 図、第 3 図は本発明の実施例の誘電体フィルタの構成を示す構造図、

第 4 図は本発明の実施例の動作を説明するための矩形導波管の TE_{101} モードの磁界と電流の分布図、

第 5 図は従来の誘電体フィルタの構造図である。図において、

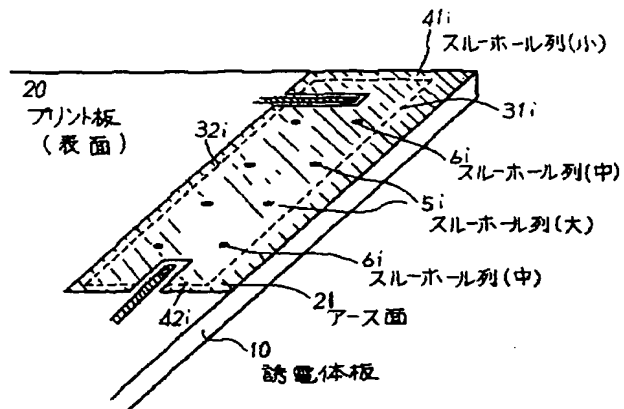
10 は誘電体板、20 はプリント板、21, 22 はアース面、31, 32; 41, 42 は 2 組の溝、31i, 32i; 41i, 42i は 2 組のスルーホール（小）列、5i, 6i はスルーホール列、71 は入力伝送線路、72 は出力伝送線路、81, 82 は入出力結合部である。

【第1図】

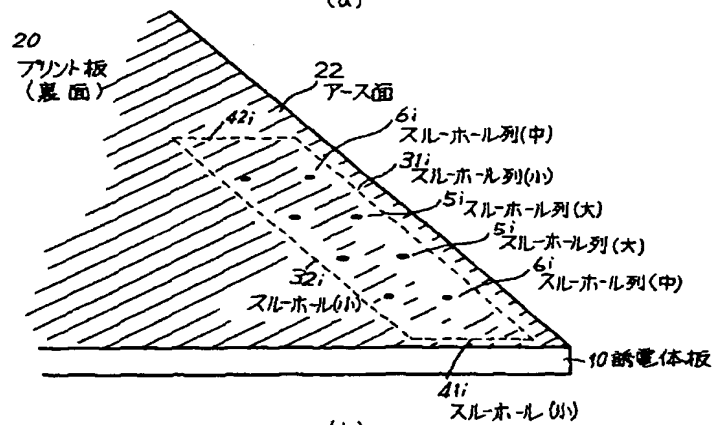


本発明の誘電体フィルタの基本構成を示す原理図

【第2図】



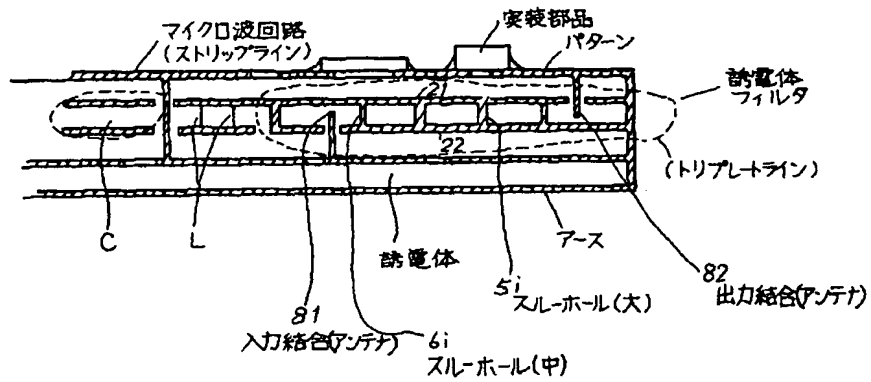
(a)



(b)

本発明の実施例の誘電体フィルタの構成を示す構造図

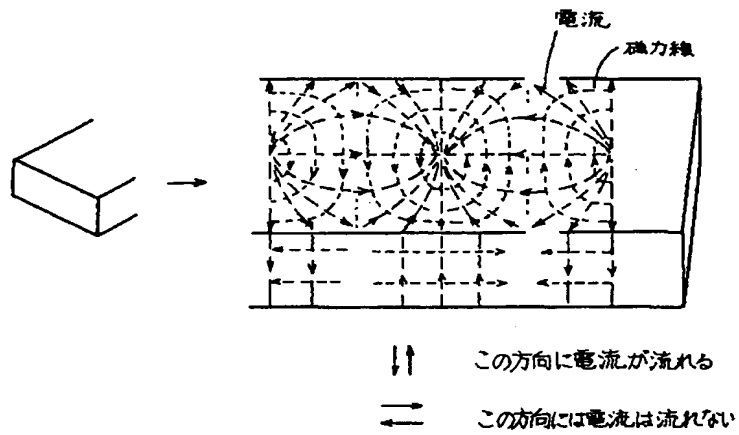
【第3図】



断面図

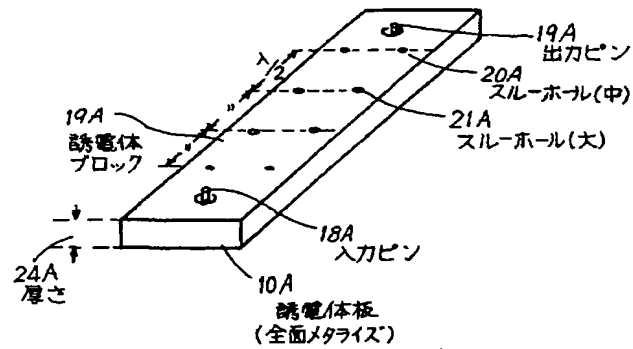
本発明の実施例の誘電体フィルタの構成を示す構造図

【第4図】

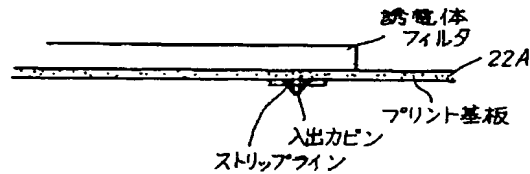


本発明の実施例の動作を説明するための矩形導波管の
TE₁₀₁モードの磁界と電流の分布図

【第5図】



(a)



(b)

従来の誘電体フィルタの構造図

フロントページの続き

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1. JP,07-105645,B(1995)

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CLAIMS

[Claim(s)]

[Claim 1] It is the dielectric filter which transmits microwave to the longitudinal direction of the printed circuit board (20) which covered the vertical side of a dielectric plate (10) with the metal, and was made into the ground side (21 22) in the TE₁₀₁ mode of rectangular waveguide. A conductor a lot every 2 sets of slots which counter (41 32; 31 42), [the front face which connects the ground side (21 22) of the vertical side of this dielectric plate to the longitudinal direction and longitudinal direction of this printed circuit board] The path of the hole of each train by regularity (Abbreviation $\lambda / 2$) The through hole train of arbitration (5i, 6i), [spacing of the mutual train which penetrates this dielectric plate into the part surrounded in the slot of these two groups, and connects an up-and-down ground side (21 22) with it] The dielectric filter characterized by having the I/O bond part (81 82) connected with the transmission line (71 72) of the front face of this printed circuit board at the anterior part and the posterior part of this through hole train (5i, 6i).
[Claim 2] The dielectric filter given in the 1st term characterized by substituting 2 sets of through hole trains (31i, 32i, 41i, 42i) of a path smaller than the path of the hole of each train of said through hole train (5i, 6i) for 2 sets of aforementioned slots (41 32; 31 42).

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[Summary of the Invention]

It is related with the dielectric filter of the band pass which transmits microwave to the longitudinal direction of the printed circuit board which covered the vertical side of a dielectric plate with the metal, and was made into the arm side in the TE101 mode of rectangular waveguide. When mounted in the flat-surface printed circuit board of the dielectric substrate with which other passive circuit elements are mounted A conductor a lot every 2 sets of slots which oppose, [the front face which connects the ground side of the vertical side of this dielectric plate to the longitudinal direction and longitudinal direction of a plant plate for the purpose of the small dielectric filter which does not spoil the whole smoothness] The path of the hole of each train by regularity (Abbreviation $\lambda / 2$) The through hole train of arbitration, [spacing of the mutual train which penetrates this dielectric plate into the part surrounded in the slot of these two groups, and connects an up-and-down ground side with it] It constitutes so that it may have the I/O bond part connected with the transmission line of the input of the front face of this printed circuit board, and an output at the anterior part and the posterior part of this through hole train. Moreover, 2 sets of through hole trains of a path smaller than the path of the hole of each train of said through hole train are substituted for 2 sets of aforementioned slots as an embodiment.

[Industrial Application]

This invention relates to the dielectric filter which transmits microwave to the longitudinal direction of the printed circuit board which started the band-pass filter of the microwave used for microwave radio equipment, especially covered the vertical side of a dielectric plate with the metal, and was made into the ground side in the TE101 mode of rectangular waveguide.

In recent years, chip-izing of each part article and a miniaturization are demanded with the demand of a miniaturization of radio equipment. For the reason, the small derivative filter of a half-coaxial type is offered also for the band-pass filter of microwave, but since an insertion loss becomes large with RF-izing of a communication link frequency and a half-coaxial-type filter does not bear practical use, a new filter which is equal to use by the RF is desired. Therefore, the derivative filter which transmits the printer plate which covered the vertical side of the above-mentioned derivative plate with the metal, and was made into the ground side to a longitudinal direction in the TE101 mode of rectangular waveguide is devised.

[Description of the Prior Art]

The dielectric filter transmitted in the TE101 mode of rectangular waveguide conventionally, as shown in Fig. 5 A front face with a dielectric the whole surface of tabular dielectric 10A Block 19A of a conductor, [the contents which carried out metallizing] Only a necessary number of stages prepares through hole (inside) 20A and through hole (size) 21A of $\lambda/2$ of posts about. a longitudinal direction -- spacing -- a center of filter frequency -- Input pin 18A and output pin 17A were prepared near [the] both ends, and it was soldered to the front face of external printed circuit board 22A, for example, the transmission line of a slip line, and had become the structure of transmitting the microwave from this transmission line in the same mode as the TE101 mode of rectangular waveguide. And if the path of through hole (inside) 20A and the path of through hole (size) 21A are made thick with regards to the pass band width of a filter, respectively, bandwidth will become narrow, if it is made thin, it will have the property which becomes large and thickness 24 of tabular dielectric 10A A will be effective against the insertion loss of a filter, if it is made thin, an insertion loss will increase, and if it thickens moderately, an insertion loss will decrease. Therefore, the conventional dielectric filter of Fig. 5 If thickness 24 of dielectric 10A A will become thick if it is going to decrease an insertion loss, although the die-length direction becomes small, and it mounts in the front face of printed circuit board 22A as shown in (b) of Fig. 5 The thickness of the mounting condition of printed circuit board 22A became thick, while the components miniaturization of the others was carried out, this

filter governed the configuration of printer plate 22A, magnitude, etc., and there was a problem of being disadvantageous in the miniaturization of the whole equipment.

[Problem(s) to be Solved by the Invention]

This invention offers a technical problem the small dielectric filter which does not spoil the whole smoothness, when mounted in the flat-surface printed circuit board of the dielectric substrate with which other passive circuit elements are mounted.

[The means for solving a technical problem]

Although the thickness of a dielectric plate is effective against an insertion loss as stated previously when this technical problem considers the dielectric filter in the TE₁₀₁ mode of rectangular waveguide, it is not directly related to the form (Fig. 3 path of through holes 20A and 21A) of a post where pass band width is decided. Namely, thickness is made thin and are good also as thickness of the own dielectric of the printed circuit board, And sufficient thing which compared no-load Q value with half-coaxial resonance mode when covering the whole surface of a dielectric plate with the conductor and which can be taken highly is used. 2 sets of slots 31 where a conductor counters [the front face which connects the ground side (21 22) of vertical both sides of this dielectric plate] the longitudinal direction and longitudinal direction of the printed circuit board 20 which covered vertical both sides of the dielectric plate 10 with the metal, and was made into the ground sides 21 and 22 as shown in Fig. 1 a lot every, and 32; -- with 41 and 42 The dielectric plate 10 is penetrated into the part surrounded in the slot of these two groups. The path of the hole of each train the arm sides 21 and 22 of vertical both sides by regularity (Abbreviation $\lambda/2$) The through hole trains 5i and 6i of arbitration, [train spacing between *****] As this through hole train 5i, this invention constituted so that it might have the I/O bond parts 81 and 82 connected with the transmission lines 71 and 72 of the front face of this printed circuit board 20 at 6i anterior part and a posterior part, and its embodiment like Fig. 2 -- 2 sets of slots 31 of Fig. 1 , and 32; -- this invention which equipped each train of the through hole trains 5i and 6i with 2 sets of through hole trains 31i of a path smaller than the path of a hole, 32i;41i., and 42i is solved instead of 41 and 42.

In the principle Fig. of Fig. 1 showing the basic configuration of the dielectric filter of this invention, 10 is the dielectric plate of a tabular dielectric.

20 is the printer plate which prepared other passive circuit elements by using the dielectric plate 10 as a substrate.

21 and 22 cover the top face and inferior surface of tongue of the dielectric plate 10 with a metal, and are a ground side.

31 and 32; -- the front face where 41 and 42 connect the ground sides 21 and 22 of the vertical side of the dielectric plate 10 to the longitudinal direction and longitudinal direction of the printed circuit board 20 -- every [of a conductor / a lot] -- they are 2 sets of slots which counter.

5i and 6i -- 2 sets of slots 31, and 32; -- mutual train spacing which penetrates the dielectric plate 10 into the part surrounded by 41 and 42, and connects the ground sides 21 and 22 of vertical both sides at it is [the hole of each train] the through hole train of the path of arbitration in regularity (the abbreviation λ for a center of filter frequency / 2).

71 and 72 are the transmission lines of the input of the front face of the printed circuit board 20, and an output combined by the I/O bond parts 81 and 82 of the posterior part of the anterior part of the through hole trains 5i and 6i.

81 and 82 are I/O bond parts of the anterior part of the through hole trains 5i and 6i, and a posterior part combined with the transmission lines 71 and 72.

and 31i of Fig. 2 , 32i;41i, and 42i -- 2 sets of slots 31 of Fig. 1 , and 32; -- they are 2 sets of through hole trains of the lot [every] opposite which is a path smaller than the path of the hole of each train of the through hole trains 5i and 6i, penetrates the dielectric plate 10 and connects the ground sides 21 and 22 of a vertical side instead of 41 and 42.

[Function]

The dielectric filter of this invention in the longitudinal direction and longitudinal direction of the printed circuit board 20 the front face which countered the ground sides 21 and 22 of the vertical side of the dielectric plate 10 the lot every, and was established in them -- 2 sets of slots 31 on the conductor, and 32; -- 41 and 42 It connects and the dimension of die length and width of face is fixed. the ground sides 21 and 22 of the vertical side of the dielectric plate 10 -- the dielectric plate 10 -- penetrating -- a conductor -- Contents are the dielectrics of the printed circuit board 20, and thickness serves as a parent of the dielectric filter which forms the rectangular waveguide of the thickness of the printed circuit board 20, is combined by the I/O bond parts 81 and 82 from the transmission line 71 of an input to the transmission line 72 of an output, and carries out passage transmission of the microwave in the TE₁₀₁ mode. and 2 sets of these slots 31 and

32; -- the through hole trains 5i and 6i in which the contents surrounded by 41 and 42 were prepared in the interior of the rectangular waveguide of a dielectric carry out an operation of the post which determines the number of stages of a filter, mutual spacing of a train is chosen as abbreviation $\lambda / 2$ of a center of filter frequency, and the path of the hole of each train is chosen as arbitration in consideration of pass band width. And since the thickness is made into the thickness of the own dielectric of the printed circuit board, it is thin.

However, since the TE₁₀₁ mode is used, and sufficiently high Q value no-load [the] can be taken compared with half-coaxial resonance mode, a problem is solved.

[Example]

As it was, the principle Fig. of Fig. 1 showed the configuration of the dielectric filter of the example of this invention, and already explained it in full detail.

the derivative filter of example with this invention another [Fig. 2] -- it is -- 2 sets of slots 31 of Fig. 1 , and 32; -- it is the example which used 2 sets of through hole (smallness) trains 31i, 32i;41i, and 42i, and made break connection of the up-and-down die length and the width of face of the ground sides 21 and 22 instead of 42 and 42.

The path of 2 sets of each holes of through hole (smallness) train 31i, 32i;41i, and 42i is a path smaller than a path, divides the die length and width of face of the ground sides 21 and 22 of the upper and lower sides of a dielectric 10 into the hole of each train of the through hole trains 5i and 6i of the interior surrounded by this train, connects with it, and is taken as the tube wall of rectangular waveguide.

What divided the die length and width of face of the ground sides 21 and 22 of the upper and lower sides of the dielectric plate 10, and was connected by 2 sets of through hole (smallness) trains 31i, 32i;41i, and 42i Although there is a current which passes the bottom from on tubing or flows upwards from the bottom so that the field in the TE₁₀₁ mode of rectangular waveguide and the flow of a current may be understood that it operates as a tube wall of rectangular waveguide from the sense of the current of a dotted-line arrow head, as shown in the field of Fig. 5 , and the distribution map of a current The current which flows in a longitudinal direction is understood from there being nothing.

Fig. 3 is the dielectric filter of still more nearly another example of this invention, is the example which constituted the filter in a part of multilayer printed circuit board (parts of the 2nd layer and the 3rd layer enclosed with a dotted line), and is the example which embedded the dielectric filter of this invention at a part of ceramic composite module of microwave.

Since the dielectric filter is also made into the thickness of the own dielectric of the printed circuit board, the thickness of a dielectric plate of which example of Figs. 1 - 3 is thin [the filter], however since transmission of a microwave signal uses the TE₁₀₁ mode and sufficiently high Q value no-load [the] can be taken compared with half-coaxial resonance mode, it is satisfactory.
 [Effect of the Invention]

Since a filter can be formed in the interior of the printed circuit board according to this invention as explained above, it becomes mounting of high density and the effectiveness which contributes to the miniaturization of microwave radio equipment greatly is acquired.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

Fig. 1 is a principle Fig. showing the basic configuration of the dielectric filter of this invention,

Fig. 3 is Fig. 2 and structural drawing showing the configuration of the dielectric filter of the example of this invention,

Fig. 4 is the field in the TE₁₀₁ mode of the rectangular waveguide for explaining actuation of the example of this invention, and a distribution map of a current,

Fig. 5 is structural drawing of the conventional dielectric filter. In drawing,

10 -- a dielectric plate and 20 -- the printed circuit board, and 21 and 22 -- a ground side, 31, and 32: -- for 2 sets of through hole (smallness) trains, and 5i and 6i, as for the transmission line of an input, and 72, the transmission line of an output, and 81 and 82 are [41 and 42 / 2 sets of slots, 31i, 32i; 41i, and 42i / a through hole train and 71] I/O bond parts.

[Translation done.]

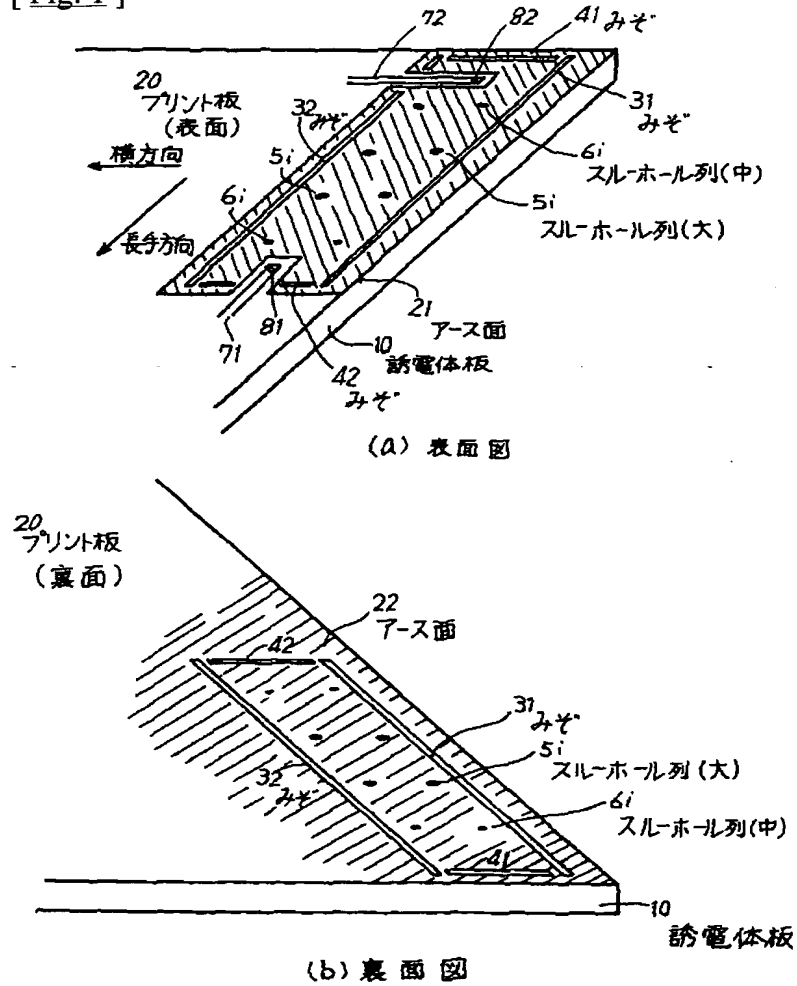
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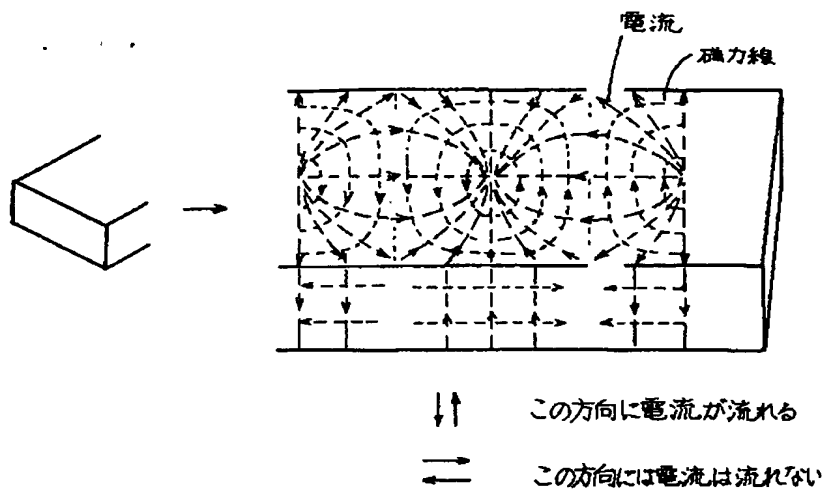
DRAWINGS

[Fig. 1]



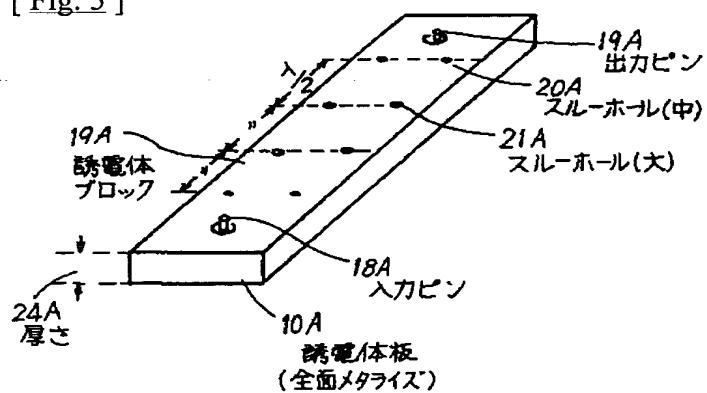
本発明の誘電体フィルタの基本構成を示す原理図

[Fig. 2]

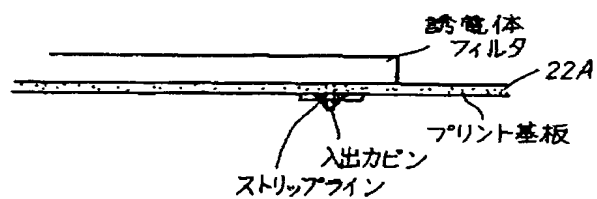


本発明の実施例の動作を説明するための矩形導波管の
TE₁₀₁モードの磁界と電流の分布図

[Fig. 5]



(a)



(b)

従来の誘電体フィルタの構造図

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